

XXII.—The Cestoda of the Scottish National Antarctic Expedition. By John Rennie, D.Sc., and Alexander Reid, M.A., University of Aberdeen. (With Two Plates.)

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The Cestode material obtained by the *Scotia* Expedition consisted of eight adult and three larvæ or immature forms. Of these, one (*Anchistrocephalus microcephalus*, Rud.) is not Antarctic, having been obtained from the Sunfish (*Orthogoriscus mola*), at Station 107, in 39° 12' S., 53° 44' W., on January 1, 1903.

Of the others, only two appear to have been previously described, viz. *Dibothriocephalus antarcticus*, Baird, and *Dibothriocephalus wilsoni*, Shipley. The hosts from which the Cestoda of the Antarctic and sub-Antarctic regions were obtained are, with the exception of the Bonito,* from which a larval *Tetrarhynchus* was obtained, Seals and Penguins. In view of this fact, the number of forms obtained may be regarded as relatively large. A study of the species on record from Arctic Pinnipedia suggests the interesting fact that the two Cestode faunas are quite distinct. Eight species of *Dibothriocephalus* are on record from Pinnipedia of the Arctic regions, none of which have so far been obtained in the Antarctic. The adult forms found, however, with one exception all belong to this genus.

A noteworthy feature is the relatively large proportion of very small and delicate species of Cestoda occurring in the Pinnipedia of the Antarctic. Indeed, none of the forms obtained can be described as large; the maximum size is that of *D. pygoscelis*, viz. 29 cm.

SHIPLEY has suggested with regard to the Cestoda of Ross's Seal that, in view of the feebleness and variability of its dentition, it probably feeds on soft substances, and expresses the opinion that the plerocercoid stage probably occurs in the tissues of Cephalopods. Jellyfish are also mentioned, and these form part of the food of this Seal.

With regard to Seal Cestodes in general, we note that although the parasites are small the infection is generally heavy, and from this it may be argued as probable that the intermediate hosts become infected without much difficulty. The embryos are extraordinarily minute, and if dissipated in the waters would probably infect drifting organisms, e.g. Jellyfish or Ctenophora, more readily than others, e.g. Fishes. On the other hand, Crustacea and similar organisms of scavenging habits, feeding on the fæces of the Seals, have an even better chance of being infected, and these may provide the intermediate host. Beyond this it is scarcely profitable to speculate further.

* This fish (*Thynnus pelamys* Linn.) it appears was found at Station 31—some distance south of the Cape Verde Islands—on 4th December 1902, and its parasite therefore cannot be described as Antarctic or sub-Antarctic.

DESCRIPTION OF SPECIES.

ARIOLA (1) divides the family Bothriocephalidæ as under :—

Sub-families :

Diplogoninæ. Two sets of gonads to each segment.

Mesogoninæ. A single set of gonads; genital apertures on surface. All the Bothriocephalidæ found, with one exception, belong to this group.

Pleurogoninæ. Marginal genital apertures.

One of the species found, *Anchistrocephalus microcephalus*, Rud., belongs to this group.

Order PSEUDOPHYLLIDEA, Carus.

Family DIBOTHRIOCEPHALIDÆ, Lühe.

Sub-family MESOGONINÆ (Ariola).

Genus *Dibothriocephalus* (Lühe).

Dibothriocephalus scoticus, n. sp. (Pl. I. figs. 1 and 2.)

This form occurred in the intestine of a Sea-leopard (*Stenorhynchus leptonyx*).

The maximum dimensions are : strobila, length 13·3 cm., breadth 6·8 mm. ; scolex, 2·5 mm. by 1·5 mm. The scolex when fully extended shows a pair of dorso-ventral suckers widely gaping posteriorly and tapering towards the tip, which is rather sharply conical. The sucker lips are rather thin, almost weak.

No distinct neck is present. The proglottides are fairly broad, with well-marked backwardly directed flanged margins. Anteriorly they are roughly rectangular, much shorter than broad; in the mature parts of the strobila they become relatively longer.

The cuticle is rather thin, and beneath it an extremely fine circular layer of muscle can be made out with difficulty. Next this is a longitudinal layer, also slightly developed. This longitudinal layer lies between the narrowed ends of the cellular subcuticula, whose elements form a clearly defined band. Following on this is the layer of the yolk follicles, which, in the mature segments, except at the level of the uterus and cirrus sac, forms a practically continuous band. Within this occur two muscle layers, a well-defined longitudinal layer outermost; while, within, a thin circular band separates the peripheral area from the central.

The longitudinal nerve cords are placed about one-fourth of the transverse diameter from the margin.

In the mature segments there are about nine testes follicles external and about six internal to the nerve cord on each side.

Central longitudinal excretory canals were not observed, but there are numerous small peripheral canals in the subcuticula just external to the yolk follicles.

The yolk cells are extremely variable in form and size, and may be described as

amoeboid in appearance. The largest measure $\cdot 017$ mm.; the smallest noted, $\cdot 012$ mm. There is a well-marked yolk reservoir of pear shape between the two lobes of the ovary.

The ovary in transverse section appears as an elongated band, becoming shorter and thicker in its more anterior parts. The larger cells measure $\cdot 014$ mm. in diameter.

The uterus consists of a winding tube of about four loops, the limbs of which in transverse section are seen to wind both dorsally and ventrally. There is a large dilated space just at the opening. On external view, the uterus in mature segments appears clustered in a rounded mass posteriorly, the winding portion being distinct only in its more anterior region. The shelled ova vary in size; the smallest measure $\cdot 070 \times \cdot 043$ mm., and the largest $\cdot 082 \times \cdot 048$ mm. They are operculate.

The testis is very large, consisting of numerous follicles occupying the greater part of the medullary region. The follicles are more or less spherical in form, and lie in close-set rows extending across the whole width of the proglottis, being separated from each other by the dorso-ventral muscles, which are correspondingly numerous. A common size of a follicle in a mature proglottis is $\cdot 069$ to $\cdot 087$ mm. in maximum diameter.

The cirrus sac is thick-walled, and oval in transverse section, presenting no distinctive peculiarities.

From the foregoing description, it appears that this species has not been previously observed. From the same host, VON LINSTOW (3) has described *D. quadratus*, and with his account a careful comparison has been made. The scolex in the two species is very similar in general form. In *D. quadratus* it measures $1\cdot 3$ mm. by $\cdot 71$ mm., or about half the dimensions of the present species. The strobila is $22\cdot 5$ cm. long, and $3\cdot 5$ mm. broad at its widest part; the proportions of the present species are, it will be observed, altogether different. The longitudinal dimension of the ova given by VON LINSTOW is $\cdot 055$ mm., which is considerably less than the smallest measurement observed in *D. scoticus*. The shelled ova are in *D. quadratus* described as non-operculate; in the present species they are clearly operculate. Further, the appearance of the yolk follicles is quite different in the two species.

A comparison has also been made with other *Dibothriocephalus* species recorded in Pinnipedia, with like negative results.

In honour of the Scottish Expedition, we have named this new species *Dibothriocephalus scoticus*.

Dibothriocephalus coatsi, n. sp. (Pl. I. figs. 5 and 6.)

In *Stenorhynchus leptonyx* there occurred along with *Bothriocephalus scoticus* a number of specimens of a small, hitherto unrecorded Cestode.

The total length of strobila of the examples found is from 42 to 80 mm. In a specimen of 42 mm. the width at the broadest part, which is 23 mm. from the anterior end, is $1\cdot 8$ mm.

The scolex is of distinctive appearance, being long, blunt, and of almost uniform width, measuring 2 mm. by .75 mm. in extent. There is a pair of shallow, widely gaping suckers, dorso-ventrally placed, extending the whole length, and open at both ends (fig. 5).

The mature segments are rectangular in form, with slightly undulating margin. In the specimen 42 mm. long, the largest, which were terminal, measured .61 mm. long by 1.04 mm. broad. They are also relatively thick, measuring in section .61 mm. dorso-ventrally.

The cuticula and sub-cuticula are of typical appearance. Beneath the sub-cuticula are the yolk follicles. These are very numerous, and in many sections, *e.g.* those at the level of the ovary, they form a practically continuous band. The individual yolk cells, which vary in form, measure on an average about .014 mm. by .017 mm.

The shape of the ovary presents no unusual features. In a section at the level of its junction with the yolk ducts it has the form of a transverse band. Posteriorly to this it appears as a pair of detached, more or less rounded, and thicker masses. The ovarian cells measure .017 mm. by .01 mm.

The uterus consists of a few close coils which wind dorso-ventrally, so that in section it usually has the appearance of an almost complete circle. The shelled ova measure .052 mm. by .041 mm.

The testis follicles, which occupy the greater part of the central area of the proglottis, measure in their greatest dimensions .034 mm. by .052 mm.

There is a well-developed inner layer of longitudinal muscles; the dorso-ventral muscles are also well marked.

The longitudinal nerve cords are extremely ill-defined and weak, although relatively large. They are placed slightly less than one-fourth of the width of the proglottis from the margin, and are slightly nearer to the ventral than the dorsal surface.

The central longitudinal excretory canals can be made out only in places. They are placed at the extreme lateral margin of the central layer, next to the longitudinal muscles, but, as they frequently cannot be traced in serial sections, they probably anastomose a good deal. Peripheral canals are present just exterior to the yolk follicles. These are most clearly visible at the lateral margins, where two or three frequently occur close together.

This form differs in most particulars from all the hitherto described species of the group to which it belongs, and we have therefore classed it as new, naming it *Dibothriocephalus coatsi*. It is an interesting fact that two new species should have been obtained from *Stenorhynchus* by the Scottish Expedition, and that *D. quadratus*, the only form hitherto described from this host, should not have been found.

*Dibothriocephalus antarcticus.**Bothriocephalus antarcticus*, Baird, 1853.

About a dozen or more examples of this species were obtained from the stomach of a Ross's Seal, *Ommatophoca rossi*. These were all smaller than BAIRD's specimens, which were about 9 inches long. The *Scotia* examples range from 132 to 29 mm., but most measure about 100 mm. BAIRD's (2) description is rather brief and confined to externals, but from this, together with his excellent figure, there is no mistaking the identity of the *Scotia* specimens with his type.

This species was also found by the *Discovery* Expedition, and the specimens are described by SHIPLEY, to whose account reference is made below.

Dibothriocephalus antarcticus, Baird (2), is a slender-bodied worm, with a conical scolex and with fairly sharp tapering point. The two suckers are long and comparatively deep. According to BAIRD, there are "two small rounded projecting lobes" at their posterior margins, but these in the *Scotia* examples are only occasionally present, and appear to be dependent upon the state of contraction of the animal. There is no neck; the anterior part of the body for some distance behind the scolex is rounded, resembling an annelid in form; in the more posterior part the form is thick and flattened, being here elliptical in section. The colour is reddish yellow. The segments, even in the mature part of the animal, are very short; they are deeply constricted off from each other, and as the free margins are directed backward the segments appear to overlap more than they actually do. The only dimensions given by BAIRD are: "length, about nine inches; greatest breadth of body, about three lines," and although the *Scotia* examples are very much smaller, the proportions agree well. The *Discovery* specimens come much nearer in length to the *Scotia* examples, although there is a very distinct discrepancy as regards width. SHIPLEY reports that most of the *Discovery* examples "were just under 10 cm.," and that "the greatest breadth is 7 mm. in the largest specimen." The longest *Scotia* worm is 13.2 cm., and its greatest breadth is 4.5 mm.; most of the specimens are about 4 mm. in width. Again, as regards scolex dimensions, SHIPLEY gives "3 mm. in length and 3 mm. in breadth posteriorly." In none of the *Scotia* specimens is the greatest breadth equal to the length of the head; they measure from 3 to 3.5 mm. long by 2 mm. wide. The actual differences here, however, are slight.

A general account of the anatomy is given by SHIPLEY (4). He mentions that, besides the two longitudinal canals of the excretory system, "there are also small canals which lie close under the surface at the edges of the proglottides, usually two at each side, but they also break up from time to time into twisting branchlets." These canals appear to be very numerous; from 42 to 45 may be present in a section, while at each lateral margin a group of four can usually be made out.

The testes which occupy the central layer lie mostly towards the dorsal surface. There are from 18 to 20 follicles in a transverse section.

Dibothriocephalus wilsoni, Shipley. (Pl. I. fig. 4.)

This small tapeworm, which SHIPLEY (4) has already referred to as "very attractive" in appearance, was also found by the *Scotia* investigators, although not in the same host. These were obtained in the intestine of Weddell's Seal along with numbers of *Bothriocephalus mobilis*, n. sp. The *Discovery* specimens occurred in Ross's Seal (*Ommatophoca rossi*).

It is a small, semi-translucent, delicate-looking Cestode, not undeserving of SHIPLEY's epithet. The scolex is short and conical in the contracted state, as appears in SHIPLEY's figure. In more extended specimens, however, it is more rounded at the free end, as well as longer. An interesting point is the early appearance of mature segments; the first of these may be but the fifth behind the head. SHIPLEY's dimensions for this species are: length, 4 to 5.5 mm.; greatest breadth, 1 mm.; 9 to 13 proglottides; scolex, .5 mm. Some of the *Scotia* specimens are quite 10 mm. in length, and have 18 segments; one which measured less than 4 mm. contained 8 segments, none of which were mature, but in 5 of which the outline of the developing uterus and other sex ducts could be traced in a surface view.

The only other point made out with regard to which SHIPLEY's account may be supplemented refers to the dimensions of the ova. His figures are .042 by .035 mm., and these he gives as about the average. We find the ova do vary in size, and while we have not struck an average figure, we think that on the whole the dimensions we have to quote are fairly common and typical. These are .069 by .037 mm.

The general appearance of this Cestode is given in fig. 4.

Dibothriocephalus mobilis, n. sp. (Pl. II. figs. 7 to 10.)

This is an extremely pretty little Cestode, highly translucent, which was found in the intestine of Weddell's Seal, where it occurred in considerable numbers. It measures from 12 to 20 mm. in length, and is about 2 mm. at its widest part. The scolex is broad at its free end, narrowing towards its junction with the strobila. It measures .5 mm. in diameter. The suckers are lateral in position, deep and widely gaping the whole length of the scolex, and having extremely mobile lips. They are capable of extension backward, showing in such a case large posteriorly directed flaps. Owing to the extreme mobility of the scolex, it is rather variable in form, although its general appearance remains characteristic (figs. 7 and 8).

No neck is present. The segments are rectangular, at first narrow, being about twice as broad as long, lastly becoming practically square at the posterior end. The number varies from about 16 to 25; they are mature about the 7th or 8th segment. On a surface view the genital pores are seen to lie together close to the anterior border of the proglottis.

The uterine pores are placed for the most part alternately right and left of the middle line in successive segments. The uterus in the immature segments shows three

loops to each side; in the mature parts it appears as a rounded mass filled with the shelled ova. The yolk follicles are exceedingly numerous in the mature segments, lying closely over the whole of the inner part of the peripheral layer and visible externally. They form morula-like masses, more or less irregular in shape. In section they are mainly circular, and measure ·052 mm. in diameter. The individual yolk cells are large, measuring when fully grown about ·016 mm.

The ovary consists of a pair of flattened circular masses, which in their maximum development measure ·174 mm. in diameter, connected by a narrow band in the middle. The shelled ova measure ·051 mm. × ·034 mm. They are not operculate.

The testes follicles, which occupy the central area, occur in the planes between those occupied by the yolk follicles. Where the yolk follicles occur the central area is narrowed, and only the extreme ends of the individual testes appear here. The individual cells of the testes are extremely small. The cirrus sac is highly muscular, circular in form; the short protrusible penis is relatively thick.

The cuticle is remarkably thick, measuring ·014 mm.; the sub-cuticle consists of fairly large cells of irregular shape, amongst which the small excretory canals occur. These are fairly numerous, viz. between 30 and 40. The rest of the body consists largely of a thin and loosely packed parenchyma.

This form is clearly differentiated from all the other small Bothriocephalids in the laterally placed suckers and distinctive form of the scolex, size and general shape of the proglottides, nature of the yolk follicles, and characteristics of the ova.

We propose for it the name of *Dibothriocephalus mobilis*.

Dibothriocephalus pygoscelis, n. sp. (Pl. II. figs. 11 and 12.)

A small quantity of Cestode material, undated, and labelled, "Adult tapeworms from some species of *Pygoscelis*, probably *P. antarctica* or *P. adelia*; possibly, though not likely, *P. papua*," was found to consist of a number of extremely brittle fragments of a *Dibothriocephalus*.* Only one or two head pieces could be found, the larger of which measured 29 cm. Fragments up to 21 cm. in length occur in the collection.

The scolex measures 1·8 mm. in length, is of almost uniform breadth, slightly broader at the posterior border, where it measures ·7 mm. in diameter. The suckers are long and shallow, forming a pair of dorso-ventral grooves, extending nearly the whole length of the scolex.

There is a short neck; the anterior proglottides are markedly flanged, and at least four times as broad as long. In the broadest part of the worm they reach 9 mm. in breadth and about 1·5 mm. in width. The common genital pore can be seen upon the ventral surface as a rather broad crescentic slit, a little way behind the anterior border, while the uterine pore is placed slightly behind in the middle line.

* This was found by Dr PIRIE lying on the snow near the beach at Scotia Bay, South Orkneys, where a number of penguins had been congregated—chiefly *P. antarctica* and *P. adelia*,—January 11, 1904. See *Zoological Log*, p. 95, including footnote.

The following additional points have been made out.

The cuticula and sub-cuticula are well developed. Peripheral excretory canals are numerous. The yolk follicles are very numerous and large. In longitudinal section they appear as closely arranged, long, narrow bands, sometimes spindle-shaped, extending from the sub-cuticula to the longitudinal muscle layer, which is well marked.

The uterus has four or more turns, winding dorsally and ventrally in a spiral manner (fig. 12). The shelled ova vary in size. A common dimension is: length .073 mm., breadth .051 mm. But there is a small proportion of long and narrow eggs measuring .100 mm. by .041 mm. The eggs are operculate.

The species appears to be unrecorded previously. No *Dibothriocephalus* species have hitherto been described from either Arctic or Antarctic birds. It resembles generally the scolex of *D. quadratus* in form and dimensions, but the proglottides are smaller and the ova dimensions are dissimilar; it resembles *D. cordatus* in the dimensions of the eggs, but disagrees in other features. *D. lanceolatus* is a much smaller form. In general features *D. pygoscelis* resembles *D. romeri*, but is on the whole larger, and again the egg dimensions are greater. In particular, the specially large size of the shelled ova and form of the scolex differentiate it from all other described Arctic or Antarctic species occurring in either birds or Pinnipedia.

We propose to name it *Dibothriocephalus pygoscelis*.

Sub-family PLEUROGONINÆ (Ariola).

Genus *Anchistrocephalus*, Monticelli, 1890.

SYNONYMS.

Tænia, Auctorum.

Bothriocephalus, Rudolphi, 1808.

Dibothrium, Diesing, 1850.

Polyonchobothrium, Diesing, 1850.

Anchistrocephalus, Monticelli, 1890.

Anchistrocephalus microcephalus (Rud.), 1819. (Pl. I. fig. 3.)

This tapeworm was found in very large numbers in the intestine of the Sunfish, *Orthogoriscus mola*, in a mass weighing several pounds, and almost completely blocking the intestine. *O. mola* was captured at Station 107.

It was first described by RUDOLPHI, in 1810, and its occurrence has since been noted and its anatomy described by other investigators. It is a readily recognisable species, and does not appear to have been recorded in any host other than the Sunfish. The scolex has a pair of rather deep, open, thick-margined, square-looking suckers topped by a hemispherical rostellum, the base of which is encircled by several close-set rows of small hooks (fig. 3 (a)).

The genital pores are marginal in position (fig. 3 (b)).

The appearance of the scolex varies with the state of contraction, and the rostellum may be retracted so as to be concealed below the anterior margins of the suckers, and thus appear to be absent. Similarly, the anterior proglottides, which in the extended condition are rather long, with thick, overlapping posterior margins (described by ARIOLA as "campanulate"), in the contracted condition become rectangular, short, and relatively very broad. The maximum size occurring in the *Scotia* specimens is 40 cm. by 5.5 mm., which is considerably less than that given by ARIOLA, viz. 66 cm. by 7.5 mm. This, which appears surprising in view of the large number of examples in the collections, is probably due to breakages. The specimens occurred very closely matted together, and there are numerous fragments without scolices. ARIOLA (1) has given a summary of the chief features of this species.

The following additional points have been made out in transverse sections.

The longitudinal nerve cords, which are large and well defined, are situated about one-fifth of the transverse diameter from the margin, external to the longitudinal excretory canals.

The central excretory canals are six in number, three each, right and left of the middle line.

Order CYCLOPHYLLIDEA, van Ben.

Family TÆNIIDÆ, Ludw.

Hymenolepis, sp. (?).

The Cestode here described was found in the intestine of the Ringed Penguin, *Pygoscelis antarctica*—locality, South Orkneys. It occurred in groups of from four to twelve, having their heads within a small swelling upon the intestine of about the size of a pea. The swelling, which had brownish granular contents, projected upon the outer side of the intestine. The heads appeared, as far as could be made out, to lie freely in the cavity formed by the swelling or cyst. This opened to the intestinal cavity by a very narrow aperture through which the closely grouped necks of the worms passed.

The "heads" are of very irregular and variable form. This anterior region is best described as a "pseudo-scolex." The "neck" is very long, and in most cases is at one part enlarged in a long oval form. The segmented portion is nearly cylindrical—not flattened—and, apart from colour, has quite an annelid appearance. The following measurements were made :—

Length of "neck," 6–12 mm.

Width of "neck" at broadest part, .93 mm. to 1.13 mm.

Length of segmented region, about 1 cm.

Number of segments, about 40.

Diameter of broadest segment, 1.21 mm.

As already stated, the "heads" are very irregular in form. In the neck region calcareous corpuscles are very numerous.

The oldest proglottides are sexually immature. Only the testes are developed; they lie in the middle layer, occupying the area between the excretory vessels. There are from 16 to 19 follicles in a cross-section through their region of greatest development. The follicles are oval in section and measure from .019 mm. to .038 mm. along their longer axis.

Calcareous corpuscles are extremely abundant, especially in the cortical area; they are oval or circular in form, and measure from .0063 mm. to .0095 mm.

There is a pair of longitudinal excretory vessels on each side, placed dorsal and ventral, but quite near to each other; only the larger pair appears to be connected by transverse vessels. Both pairs have thick walls.

The longitudinal nerve cords, which lie outside but near to the excretory canals, are very ill-defined.

The question whether this type is normal is somewhat difficult to determine. The ill-defined nature of the scolex region is rather against such a view. MEGNIN (quoted by BRAUN) considers that the pseudo-scolex condition is characteristic of the very old stages of worms, but in the present case the worms are immature. Again, this condition may be a case of retarded development. This is not altogether impossible, in view of the marked pathological condition set up in the intestine at the point of attachment, and the occurrence of the parasites in groups within a single cyst, both of which conditions are unusual in other cases of Cestode fixation. On the other hand, their occurrence in this way in several different specimens suggests that the features described are usual with this species.

What positive structural data are available are not sufficient to permit of exact classification, but the type may provisionally be placed near the genus *Hymenolepis* on account of the shape of the segments, the character of the neck, and the limited number of the testes.

Order TETRAPHYLLIDEA, Carus.

Family PHYLLOBOTHRIDÆ, Braun.

Phyllobothrium, sp. (Pl. II. figs. 3 and 4.)

From the arcolar tissue under the blubber of Weddell's Seal there were found on two occasions examples of a bladder-worm whose features, especially those of the scolex, are characteristic of the genus *Phyllobothrium*. One of the specimens is incomplete.

The complete specimen consists of a scolex having four much-plaited or folded bothria. Accessory suckers are absent. Behind the scolex is a neck piece slightly flattened, 17 mm. long and about 2 mm. broad. Behind the neck is a long oval bladder, creased or wrinkled upon the surface, thick-walled and hollow, with terminal pore

or slightly inverted posterior end. The bladder measures 32 mm. in length, and at its widest part is 10 mm. in diameter.

The incomplete specimen is of interest in so far as it shows a portion of the neck invaginated within the bladder. Since this is the condition in which cysticerci usually occur in the tissues of their host, the existence of another specimen in the fully extended condition in such a situation is worthy of special note.

The presence of these larval Cestodes in the subcutaneous tissue of an animal such as Weddell's Seal is of particular interest. The hosts of adult *Phyllobothria* are, as far as known, mostly Selachians.

With regard to the question as to the probable host of the adult worm, Dr BRUCE has made the interesting suggestion that this may be the Grampus. He informs me that *Stenorhynchus leptonyx* and *Lobodon carcinophaga* are frequently seen with large gashes upon their sides, which he is of opinion may be due to the attacks of a Grampus (*Orca*, sp. ?). He considers it likely that Weddell's Seal is liable to similar attacks, and in fact that the whole seal may at times be eaten. The following birds are fond of blubber, and devour the carcasses of seals, viz. the Giant Petrel (*Ossifraga gigantea*), Sheathbill (*Chinois alba*), and Skuas (*Magalestris MacCormicki* and *M. antarctica*). Such habits render them liable to infection with the bladder-worm in question, and it is possible that the normal host of the adult occurs amongst these.

Order TETRARHYNCHA, v. Ben.

Family TETRARHYNCHIDÆ.

Tetrarhynchus, sp. (Pl. II. figs. 15 to 18.)

From the muscles of the Bonito (*Thynnus pelamys* Linn.) caught at Station 31, a small number of cysticeroids of a *Tetrarhynchus*-like organism were found. These were not enclosed in a bladder, but lay quite free in the muscles, the proboscides being in a number of instances partially extruded. They were not in any instance fully extended.

The specimens measure about 6 mm. in length and $1\frac{1}{2}$ to $1\frac{3}{4}$ mm. in width. There is a thick, firm, slightly wrinkled, glistening cuticle upon the exterior. A distinctive feature is the entire absence of suckers at the anterior end. There are four slender retractile proboscides bearing about sixteen longitudinal rows of closely set, recurved hooks. The proboscides are connected with four well-developed muscular bulbs, such as are characteristic of this group.

At the posterior end there is a small spherical bulb which is retractile within a cavity. In most examples the bulb is within, but in one or two instances it occurred exerted, the body of the cysticeroid being constricted closely around its base (fig. 15).

Transverse sections of the bulb show it to contain a deeply staining connective

tissue in which there is a transverse row of ten or twelve excretory canals (fig. 18). These merge in each other, converging to a terminal pore. Longitudinal sections show the branches of the canals to be very numerous.

The body of the cysticeroid consists of a peripheral and a central portion. The former is limited by a well-defined, thick cuticle, contains numerous excretory vessels (about 60 in transverse section) and a loose parenchyma. The central region contains the muscular bulbs of the proboscides, and around these a well-developed mass of longitudinal muscles (fig. 16). The central area at its posterior end merges into the protrusible bulb (fig. 17).

The question of the more exact identification of the species to which the form belongs must be left undecided.

G. R. WAGENER (5) has described a similar form from *Phycis mediterranea*.

LITERATURE.

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- (6) ZSCHOKKE, *Fauna Arctica*, "Die Arktischen Cestoden," Bd. iii., Lieferung i., 1903.

REFERENCES TO FIGURES.

c. = cuticula.
c.s. = cirrus sac.
exc.c. = excretory canals.
exc.b. = excretory bulb.
l.m. = longitudinal musculature.
n.c. = nerve cord.
o. = ovary.
per.a. = peripheral area.

r.m. = retractor muscles of proboscides.
s.c. = sub-cuticula.
sh.ov. = shelled ova.
t.f. = testes follicles.
ut. = uterus.
v. = vagina.
y.c. = yolk cells.

EXPLANATION OF PLATES.

PLATE I.

- Fig. 1. Transverse section of *Dibothriocephalus scoticus*, n. sp., at the level of the ovary.
 Fig. 2. (a) Entire specimen of *D. scoticus*; (b) scolex of *D. scoticus*.
 Fig. 3. (a) Anterior end of *Anchistrocephalus microcephalus*; (b) immature proglottis of *Anchistrocephalus microcephalus*.
 Fig. 4. Four specimens of *Dibothriocephalus wilsoni*, Shipley.
 Fig. 5. Scolex of *Dibothriocephalus coatsi*, n. sp.
 Fig. 6. Transverse section of *D. coatsi*.

PLATE II.

- Fig. 7. Entire specimen of *Dibothriocephalus mobilis*, n. sp.
 Fig. 8. Scolices of *D. mobilis*, n. sp.
 Fig. 9. Transverse section of proglottis of *D. mobilis*.
 Fig. 10. „ „ through uterus and cirrus sac of *D. mobilis*.
 Fig. 11. Proglottis of *Dibothriocephalus pygoscelis*, n. sp.
 Fig. 12. Diagrammatic longitudinal section of proglottides of *D. pygoscelis*, showing position of sex openings and uterine coils.
 Fig. 13. Metacestode of *Phyllobothrium* sp., from blubber of Weddell's Seal.
 Fig. 14. Scolex of *Phyllobothrium* sp.
 Fig. 15. Larval *Tetrarhynchus* from the muscles of the Bonito.
 Fig. 16. Transverse section of larval *Tetrarhynchus* through retractor muscles of proboscides.
 Fig. 17. Diagram of posterior end of larval *Tetrarhynchus* showing excretory bulb retracted.
 Fig. 18. Transverse section of larval *Tetrarhynchus* through retracted bulb, showing row of excretory vessels.